Art. XXIV.—*On the Hydroids of the Neighbourhood of Dunedin.*

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Plates XVI.–XXI.

I shall divide this paper into three parts—First, an account of the methods employed in collecting and preserving the specimens, the books of reference at my disposal, the classification followed, &c.; second, a detailed account of the species obtained; and, third, a summary of results, both as regards my own knowledge and facts hitherto unrecorded.

Introduction.

My chief collecting-ground has been Otago Harbour, especially on the stones and piles under the wharves. Two species were found in rock-pools on Tomahawk Beach, where the open ocean breaks, and the skeletons of a few dead specimens were found on Kuri Beach, a few miles further south. I collected intermittently during the six months between April and October, our winter season in this hemisphere, and therefore an unfavourable time as regards weather, while only in the last one or two months is there any chance of seeing anything of the reproduction. This accounts for the frequency of those unsatisfactory words "Gonosome not present." I have preserved specimens of all the species and varieties obtained, as a rule staining them with borax carmine and mounting them in Canada balsam. Living specimens were always killed by osmic acid, since this is by far the quickest killing method known to me, often fixing the zooids before they have time to retract their tentacles. For examination of fresh specimens methyl green was usually employed as a stain, and treatment with 1 per cent. acetic acid was found to be a very satisfactory clearing agent. Sections were cut in a few cases where mere microscopic examination failed to reveal all the details of structure. Specimens to be cut in section were fixed by Flemming's strong chromo-aceto-osmic acid solution (*vide* Lee's "Microtomists' Vade-mecum," sec. 36), hardened by increasing strengths of alcohol, imbedded in paraffin, and cut in sections $\frac{1}{100}$ mm. thick. They were then stained with hæmatoxylin, and mounted in Canada balsam in the usual way.

I have had at my disposal a fair number of books and papers on the hydroids. The following are those that I have actually consulted :—Allman : Gymnoblastic Hydroids ; Trans. Royal Society, vol. clxviii. ; "'Challenger' Reports" in vols. vii. and xxiii. ; "Linnæan Society Journal," vol. xii. ; "Gulf Stream Hydroids." Hincks : Ann. and Mag. of Natural History, ser. 3, vol. viii. ; *ibid.*, ser. 2, vol. x. Thompson : Ann. and Mag. Nat. Hist., 10, iv. Grey : Dieffenbach's "New Zealand." Johnstone : "British Zoophytes. Hutton : Trans. N.Z. Inst., v., p. 256. Coughtrey : Trans. N.Z. Inst., vii., p. 283 ; *ibid.*, viii. ; and Ann. Mag. Nat. Hist. (4), xvii. Von Lendenfeld : Linn. Soc. N.S.W., ix. ; Zeitschrift für wiss. Zool., Band. xxxviii. Bale : Linn. Soc. N.S.W., 2, iii. ; Catalogue of Aust. Hyd. Clarke : "Bulletin of Comparative Zoology of Harvard College," vol. xxv., No. 6. Farquhar : Catalogue of N.Z. Hydroids, in Trans. N.Z. Inst., vol. xxviii., p. 459. In all, nineteen books and papers. Other works are referred to in the descriptions of the species, but these are all I have had the opportunity of consulting for myself. Mr. Farquhar's paper has been of the greatest service to me, as it contains an exhaustive and absolutely correct catalogue of our hydroids, with references to all the works in which they have been mentioned. Hydroids described under many names have been identified by careful comparison, and the study of the group greatly facilitated thereby.

I have followed the classification given by Allman in his report on the hydroids collected by the "Challenger" Expedition, vol. xxiii., p. lii.

Sub-order.	*Legion.*	*Family.*
Gymnoblastea	Tubularinæ ..	Clavidæ, Bougainvillidæ, Eudendridæ.
	Hydractininæ ..	Hydractinidæ, &c.
	Corymorphinæ	Monocaulidæ. &c.
	Hydrolarinæ ..	Monobranchidæ, &c.
Calyptoblastea	Campanularinæ	Campanularidæ, &c.
	Sertularinæ ..	Sertularidæ, Syntheciidæ, &c.
	Plumularinæ ..	Plumularidæ, Aglaophenidæ, &c.
	Thalamorpha ..	Idiidæ.

GYMNOBLASTEA.

CLAVIDÆ.

Tubiclava fruticosa. Plate XVI., figs. 1, 1*a*.

Tubiclava fruticosa, Allman, 1871, Gymno.-Hyd., 257.

Trophosome : Hydrocaulus attaining a height of 1 in., more or less branched ; perisarc smooth. Hydranths claviform, tentacles occupying the distal two-thirds of the zooid. They are about fourteen in number.

Gonosome : Unknown.

Hab. Europe; Dunedin.

The specimens found by Allman were of a bright-vermilion colour and $\frac{1}{3}$ in. in height. Mine, as I say, are a full inch in height, and of only a very dusky-red colour. They were, however, found under a wharf at Dunedin, and quite covered with slime and dirt. After preservation in spirit they have become quite black. My specimens grow in little tufts, just as Allman describes his as doing.

BOUGAINVILLIDÆ.

Hemitheca, nov. gen.

Hemitheca intermedia, nov. sp. Plate XVI., figs. 2, 2*a*.

Trophosome: Hydrocaulus branching and well developed, divided into internodes by distinct constrictions in a conspicuous perisarc. A branch springs from the distal part of each internode of the main stem, and a hydrotheca from the same part of each internode on the branches. The hydrotheca does not deserve this name, for though it covers the peduncle of the hydranth, swells into a cup shape, and has a small intrathecal ridge, yet the zooid is quite incapable of being retracted into it. Hydranth has a conical hypostome, surrounded by eighteen tentacles, disposed in a single row.

Gonosome: Not present.

Hab. Submerged piles, Dunedin Wharf.

This genus possesses all the interest common to transition forms, for it markedly partakes of the characters of both gymnoblasts and calyptoblasts. The method of growth and branching, the division into internodes, the pseudo-hydrothecæ with their intrathecal ridges, all belong to the sertularian type of hydroids, and if I had found this as a dry dead specimen I should have referred it to the genus *Campanularia;* but the irretractability of the zooids (which is quite diagnostic of gymnoblasts), the conical hypostome, with its single row of tentacles surrounding it, is quite a characteristic of the *Bougainvillidæ*. The colony in my specimens reached the height of 2 in. The time of the year perhaps accounted for the entire absence of gonophores. Both specific and generic names denote the place of this hydroid between the two sub-classes.

TUBULARIADÆ.

Tubularia attennoides. Plate XVI., figs. 3, 3*a*.

Tubularia attennoides, Coughtrey, 1875, Trans. N.Z. Inst., viii., 302.

Trophosome: The hydrocaulus consists of a cluster of simple semi-tortuous stems springing from a branched creep-

ing hydrorhiza. The hydrophyton is from 1 in. to 2 in. in height. Perisarc is annulated for the proximal third of its length, where it is tough in texture and horny in colour; higher up it is only irregularly wrinkled and transparent, while near its distal end it is again delicately annulated. Hydranth consisting of two parts, each bearing its row of tentacles, proximal row about 24, distal about 16. General colour of the zooid, orange-vermilion.

Gonosome: Not present.

Hab. Dunedin Harbour and Tomahawk Beach, in rock-pools.

As this hydroid grows in patches about the size of a five-shilling-piece attached to the side of a rock-pool, with its bright colours and waving tentacles quite visible to the naked eye, it forms one of the prettiest objects to be met with in the rock-pools of our coast. When on a slide or in a watch-glass of salt-water it has a curious habit of curling up its tentacles into more or less of a spiral. The colouring is deepest within the distal or inner circuit of tentacles, and extends in a dusky vermilion into the distal end of the cœnosarc. Sections $\frac{1}{2500}$ in. in thickness failed to show any trace of nerve cells, but showed that the endoderm cells almost close up the cavity of the enteron, leaving only a narrow tube.

Obelia nigrocaulus, nov. sp. Plate XVII., figs. 1, 1*a*.

Trophosome: Hydrocaulus irregularly branched, the branches bearing hydrothecæ on alternate sides. Branches annulated (6 or 7 rings) above the origin of each hydrotheca. Hydrothecæ supported on pedicels almost as long as the theca and marked with 6–8 annulations; conical rather narrow, graceful, and with entire thecostome. Basal part of hydrocaulus deep-black, further up dark-brown, next light-brown, and distal branchlets quite transparent. Hydrothecæ borne only on distal ends of branches.

Gonosome: Not present.

Hab. On stones; very plentiful at low-water mark, Dunedin Harbour.

On several occasions I picked up stones covered with a black bristly growth while looking for hydroids under the Dunedin wharves. My pocket-lens showed nothing of the structure of this growth, and I frequently threw it away as a decayed seaweed; but one day, my curiosity having been piqued, I took a piece home and examined it in sea-water under the microscope. Then I found that, though the greater part of the growth was enclosed in a dense black cuticular substance, the distal parts of it bore very graceful campanulate hydrothecæ, from which equally graceful and slender polyps were protruded and actively waving their tentacles.

The black pigment lies in the perisarc, and seems to be deposited periodically, since it is deepest in the oldest parts of the hydrocaulus. The specific name is descriptive.

Obelia geniculata. Plate XVII., figs. 2, 2*a*.

Obelia geniculata: Linnæus, 1767, Syst. Nat., i., 1312. Allman, 1864, Ann. Nat. Hist. (3), xiii., 372, 1888; Rep. Hydroida, Chall. Exp., vol. 23, pt. 70, p. 23. Coughtrey, 1875, Trans. N.Z. Inst., viii., 299; Ann. Nat. Hist. (4), xvii., 24. Hincks, 1868, Hist. Brit. Hyd. Zooph., 149. Bale, 1884, Cat. Aus. Hyd., 59, 1894; Proc. Roy. Soc. Vic. (new series), vi., 99. Marktanner-Turneretscher, 1890, Annal. des k. k. Natur. Hofm., v., 208.

Laomedia geniculata: Lamouroux, Cor. Flex., 205. Johnstone, Brit. Zoo., 103. Coughtrey, 1874, Trans. N.Z. Inst., vii., 290.

Sertularia geniculata, Linnæus, Syst. Nat., i., 1312.

Eucope diaphana, Agassiz, Nat. Hist. U.S., iv., 322.

Trophosome: Hydrocaulus consisting of simple stems, which arise from an open network hydrorhiza, and attain a height of $\frac{3}{4}$ in. Hydrothecæ conical, slender, with entire margin, alternate, supported each on a strongly annulated peduncle. Below the peduncle in every case is a bracket or knee-like swelling of the chitinous perisarc, which gives the species its name.

Gonosome: Gonangia borne on short annulated peduncles which spring from the angles between the hydrothecæ and the stem, urn-shaped, gradually widening from below upwards, and terminating distally in a short band-like neck which carries the orifice on its summit.

Hab. Australia; Wellington Harbour; Cook Strait; south and east coast of South Island; Europe; east coast of North America.

Coughtrey remarks that this species presents some variation between its New Zealand and European forms, the chief being the greater strength and stoutness of the New Zealand variety. A specimen that I secured at Port Chalmers seemed to have gone into a purely reproductive phase; all the nutritive polyps were dead, and even the hydrothecæ, with part of their peduncles, were broken off; but the whole hydrocaulus was covered with gonangia, from which the medusa buds, although it was mid-winter, were in the act of escaping. Another specimen from Tomahawk Rocks showed the same peculiarity. This is one of the commonest hydroids in our harbour, often spreading over whole masses of seaweed. Its milk-white appearance as it floats in the water, and its

bracket-like swellings of perisarc as it lies on the microscope slide, always make it easy to recognise.

***Calycella parkeri,** nov. sp. Plate XVII., figs. 3, 3*a*, 3*b*, 3*c*, 3*d*, and Plate XVIII.

Trophosome: A creeping filamentous hydrorhiza gives off shoots which are delicate, transparent, profusely branched, and rise to the height of 1 in. Hydrocaulus strongly ringed above the origin of each branch; branches annulated above their origin and distal to the origin of each hydrotheca; pedicels of hydrothecæ annulated. Hydrothecæ alternate, campanulate, with thecostome entire, wavy or regularly serrated, with small even teeth. Interior of central cavity of cœnosarc pigmented. Hypostomes very large.

Gonosome: Reproduction by means of sporosacs or degenerate medusæ affixed to the blastostyle. The gonatheca is large and campanulate, with a broad open mouth. Three sporosacs, as a rule; one blastostyle, which elongates as the distal sporosacs are extruded. They remain connected with, are receiving nourishment through, the blastostyle till the ova are matured, and the planulæ or ciliated larvæ formed.

Hab. On piles, Dunedin Harbour.

The most remarkable feature about the trophosome of this hydroid occurs in connection with the zooid. The hypostome is extremely distensible, and often expands into a great trumpet-like body considerably larger than the zooid itself. While in a state of retraction it projects above the retracted tentacles. A brown pigment is lodged in the endoderm cells. The nematocysts of the tentacles are very large, and are placed in bands round the tentacles at regular intervals, giving them a segmented appearance. The method of reproduction seems comparatively rare among Calyptoblasts, occurring only in three *Sertularicæ* and in *Calycella*. All the sporosacs that I observed were females, containing ova, but probably the sperms are liberated earlier, and I was too late to see them. One point in the reproduction seems unlike anything that I have read about—that is, that the planula, even after it has burst the acrocyst, seemed to be attached to the spadix by a stalk. For this to be the case all the ova must remain attached to the spadix when they are budded off from it, and this is proof of the endodermal origin of the reproductive elements in this case. There are two well-defined varieties of gonosome, and I think the one with the long gonatheca and numerous sporosacs may be named variety "*Macrogonangiata.*" This hydroid grows very abundantly on the piles up to 2½ ft. above the low-water mark. Thus it was for at least four hours per tide out of water. This is the only

hydroid that I have observed living above low-tide mark. The specific name is in honour of Professor T. J. Parker, D.Sc., F.R.S.

Sertularia bispinosa. Plate XIX., figs. 1, 1*a*.

Dynamene bispinosa, Gray, 1843, Dieffenbach's "New Zealand," ii., 294.

Sertularia bispinosa: Hutton, 1872, Trans. N.Z. Inst., v., 257. Coughtrey, 1874, *ib.*, vii., 284; 1875, *ib.*, viii., 300; 1876, *ib.*, Ann. Nat. Hist. (4), xvii., 27. Bale, 1884, Cat. Aus. Hyd., 68; 1887, Trans. Roy. Soc. Vic., xxiii., 92; 1888, Proc. Linn. Soc. N.S.W., 2, iii., 745. Marktanner-Turneretscher, 1890, Annal. des k. k. Natur. Hofm., v., 229.

Sertularia operculata (?), Thompson, 1879, Ann. Nat. Hist. (5), iii., 106.

Diphasia symmetrica, v. Lendenfeld, 1884, Proc. Linn. Soc. N.S.W., ix., 414.

Trophosome: The hydrophyton is long, lax, and strong. Hydrocaulus sparingly dichotomously branched. Hydrothecæ opposite, tubular; aperture obliquely truncated, and with two strong teeth on the outside.

Gonosome: Gonangia large and pyriform, smooth, with a strong tooth on each side at the top, rising above the gonostome.

Hab. Indian Ocean; Australia; Auckland; Lyall Bay; Dunedin.

This is by far the commonest hydroid of the neighbourhood. It grows very plentifully on the shells of sea-mussels, having there the appearance of a strong beard. In the specimens that reach a greater size the hydrocaulus is much more tender and thin. One specimen of mine is 18 in. high, while others of the strong variety do not attain a height of above 2 in.

Since writing the above I have found many specimens with a form of gonophore different from that figured in Plate XX., fig. 1. These specimens are so numerous that I cannot doubt that the variety of gonosome reproduced in Plate XX., fig. 7*a*, is the commoner one, and this opinion is strengthened by the fact that this is the form given by Coughtrey as the only one observed by him. Instead of the gonophore being pyriform it is almost triangular, and the lateral teeth, instead of being comparatively small, are immense projections rising far above the orifice of the gonophore. I have found this big-toothed variety in *S. bispinosa*, *trispinosa*, and *elongata*, and in *S. trispinosa* I have also found gradations between the two varieties figured.

Sertularia trispinosa. Plate XX., figs. 7, 7*a*, 7*b*.

Sertularia trispinosa: Coughtrey, 1874, Trans. N.Z. Inst., vii., 284; 1875, *ib.*, viii., 300; 1876, Ann. Nat. Hist. (4), xvii., 28; Bale, 1884, Cat. Aus. Hyd., 69; 1883, Proc. Roy. Soc. Vict., xxiii., 92.

Trophosome: Hydrophyton lax, bushy. Hydrocaulus delicate, silvery-yellow, branched. Hydrothecæ opposite, tubular. Thecostome with three very distinct long sharp teeth.

Gonosome: Sessile, large, triangular. Gonophores with two large teeth rising on each side of the orifice, or the teeth may be of an uneven size and the orifice on an elevation, as in fig. 7*a*.

Hab. New Zealand; Australia; Taieri Beach.

I found my specimens of this species in the same habitat as those mentioned by Coughtrey—namely, on the stems of *Boltenia*. The two varieties of gonophore are interesting, for through the uneven-toothed one we easily arrive at that figured on Plate XIX., 3*b*, as the ordinary one for *S. trispinosa* and *elongata*.

Sertularia johnstoni. Plate XIX., figs. 2, 2*a*.

Sertularia johnstoni: Gray, 1843, Dieffenbach's "New Zealand," ii., 294. Hutton, 1872, Trans. N.Z. Inst., v., 256. Coughtrey, 1874, *ib.*, vii., 281.

Sertularia subpinnata, Hutton, 1872, Trans. N.Z. Inst., v., 256.

Sertularia delicatula, Hutton, 1872, Trans. N.Z. Inst., v., 256.

Sertularella johnstoni: Coughtrey, 1875, Trans. N.Z. Inst., viii., 299; 1876, Ann. Nat. Hist. (4), xvii., 26. Thompson, 1879, Ann. Nat. Hist. (5), iii., 101. Allman, 1876, Jnl. Linn. Soc. (Zoo.), xii., 261. Bale, 1884, Cat. Aus. Hyd., 109; 1887, Proc. Roy. Soc. Vict., xxiii., 93; 1894, *ib.*, vi. (new ser.), 102.

Sertularella purpurea, Kirchenpauer, 1884, Abh. des Natur., viii.

Trophosome: Hydrophyton is lax and delicate. The hydrocaulus spreads dichotomously, and is subpinnately branched. The branching is profuse, so that the whole hydrophyton forms a tangled mass. The hydrothecæ are far apart, alternate, and exserted. Thecostome tridentate, two strong blunt cusps on the apocauline and one on the epicauline side.

Gonosome: Gonangia subpedicellate, large, transversely ridged; from six to ten ridges, the distal ones usually best marked. In some the gonostome is situated in a saucer-like depression in the truncated end of the gonangium; in others there is an infundibuliform tube; and in others again a simple tube.

Hab. Australia; Tasmania; Chatham Islands; Lyall Bay (Wellington); and east and south coasts of the South Island: in rock-pools and on seaweeds.

This hydroid is very common on the coast near Dunedin; it is found attached to fronds of a Laminarian and to pebbles. Tangled masses of dead specimens as large as one's fist are often picked up on the beach. Farquhar, in his catalogue of New Zealand hydroids, mentions this one as *Sertularella johnstoni;* but Samuel F. Clarke, writing in "The Bulletin of the Museum of Comparative Zoology at Harvard College" (vol. 25, No. 6, xi., p. 76), says that Allman is of opinion that the later knowledge gained of the genera *Sertularia* and *Sertularella* makes it necessary to unite them, retaining the name *Sertularia;* and, although I have not been able to find Allman's remarks to this effect, I have described this species under the name given it by Gray in 1843—*Sertularia johnstoni.*

Sertularia elongata. Plate XIX., figs. 3, 3*a*, 3*b*.

Sertularia elongata: Lamouroux, 1816, Hist. Polyp. Flex., 189. Thompson, 1879, Ann. Nat. Hist. (5), iii., 107. Bale, 1884, Cat. Aus. Hyd. Zooph., 75; 1888, Proc. Linn. Soc. N.S.W., ii., 3, 770. Allman, 1885, Jnl. Linn. Soc. (Zoo.), xix., 140. Marktanner-Turneretscher, 1890, Ann. des k. k. Natur. Hofm., v., 230.

Dyamene abietinoides, Gray, 1843, Dieffenbach's "New Zealand," ii., 294.

Sertularia abietinoides: Hutton, 1872, Trans. N.Z. Inst., v., 257. Coughtrey, 1874, *ib.*, vii., 285; 1875, *ib.*, viii., 300; 1876, Ann. Nat. Hist. (4), xvii., 28.

Trophosome: The hydrorhiza forms a close strong fibrous network, spreading over and clinging to the object to which it is attached; it occurs in clumps or patches, not being very extensive. Hydrophyton erect. Hydrocaulus gives off alternate pinnæ at very short intervals; the more distant of the pinnæ may be themselves branched. The hydrothecæ occur in pairs, subopposite, tubular, slightly sigmoid, incurved, and free for about a third of their length. Thecostome furnished with five or six fairly long acute teeth. The hydrothecæ occur on the main stem, as well as on the pinnæ.

Gonosome: The gonangia spring from a point just below the origin of the hydrothecæ; they are pyriform and large, being about three times as long as a hydrotheca, truncated at the orifice, and having long spines springing from the sides of the gonangia, and rising considerably above the gonostome.

Hab. Australia; Tasmania; Lyall Bay (Wellington); Kuri Beach and Taieri Beach (Otago): on fronds of seaweeds.

This species seems to vary considerably in size. Thompson

mentions that the hydrocaulus may attain the height of 5 in. My largest specimen is 3 in. long, while Coughtrey's Lyall Bay specimen barely measured 1½ in. It is, according to Bale, by far the commonest species on the south coast of Australia, but does not seem so common in New Zealand, since Coughtrey found none in Otago, and all my specimens were collected on the Kuri Beach, where, however, they are fairly abundant. It is a very beautiful feathery hydroid, and its beauty is often increased by the secondary branching of its pinnæ. Thompson describes the Australian varieties as jointed, but my specimens do not show any sign of nodes. The colour varies from a light to a rather dark horn. The specimen found at Taieri Beach was well marked by having immensely long teeth round the thecostome. In some cases these teeth are as long as the rest of the hydrotheca. In this specimen, too, the gonophore was triangular, and had immense lateral teeth like that of *S. bispinosa.*

Sertularia minima. Plate XX., figs. 1, 1*a*.

Synthecium gracilis, Coughtrey, 1874, Trans. N.Z. Inst., vii., 286.

Sertularia pumila, Coughtrey, 1875, Trans. N.Z. Inst., viii., 301; 1876, Ann. Nat. Hist. (4), xvii., 29.

Sertularia minima: Thompson, 1879, Ann. Nat. Hist. (10), iii., 104. Bale, 1884, Cat. Aus. Hyd., 89; 1887, Proc. Roy. Soc. Vic., xxiii., 109. Marktanner-Turneretscher, 1890, Annal. des k. k. Natur. Hofm., v., 231. Allman, 1885, Jnl. Linn. Soc. (Zool.), xix., 138.

Sertularia plumiloides, Bale, 1882, Jnl. Mic. Soc. Vic., ii., 21, 45.

Hydrorhiza delicate, creeping over the fronds of seaweeds. It is marked by little pit-like indentations.

Trophosome: Hydrocaulus erect, attaining a height of no more than ¼ in., and bearing six to ten pairs of opposite synthecous, adnate, tubular hydrothecæ. Thecostome bidentate and oblique.

Gonosome: One gonangium to each hydrocaulus, arising from a point just below the lowest pair of hydrothecæ. Each is a large pyriform body, with an entire gonostome.

Hab. Australia; Cape of Good Hope; Timaru; Dunedin: on small seaweeds.

The only particular of structure that I have noted in addition to those observed by others who have described this species is the presence of pit-like indentations into the hydrorhiza, and even this seems to have been noticed by Coughtrey, for he gives a drawing of the hydrorhiza, but as it is not helped by any description I cannot quite understand it. The

hydrocauli spring only from the point of intersection of two filaments of the hydrorhiza, a peculiarity which I have not noticed anywhere else where the hydrorhiza was a creeping filamentous network as here. My specimens were found completely covering the fronds of a delicate ribbon-like seaweed.

Sertularia polyzonias. Plate XX., figs. 2, 2*a*.

Sertularia polyzonias, Linnæus, 1767, Syst. Nat., i., 1312.

Sertularella polyzonias: Hincks, 1868, Hist. Brit. Hyd., 235. Bale, 1884, Cat. Aus. Hyd., 104. Johnstone, Brit. Zooph., 61. Marktanner-Turneretscher, 1890, Annal. des k. k. Natur. Hofm., v., 224. Allman, 1879, Trans. Roy. Soc., clxviii., 282.

Sertularia simplex, Hutton, 1872, Trans. N.Z. Inst., v., 257. Coughtrey, 1874, *ib.*, vii., 283; 1875, *ib.*, viii., 300.

Sertularella simplex, Coughtrey, 1876, Ann. and Mag. Nat. Hist. (4), xvii., 27.

Sertularella kerguelensis, Allman, 1876, Ann. Nat. Hist. (4), xvii., 113.

Trophosome: Hydrocaulus simple, divided by twisted joints into internodes, each bearing a hydrotheca on its upper end. Hydrothecæ adnate for about one-third of their length, large, divergent, swollen below, but narrow above. The edges of the thecostome are slightly everted, and bear four teeth.

Gonosome: Gonothecæ large, subpedicellate, with a few transverse wrinkles, very indistinct, and a short neck.

Hab. Europe; North America; Falkland Islands; South Africa; Kerguelen; Australia; Lyall Bay; Timaru; Dunedin.

This hydroid occurs in immense numbers on seaweeds and stones washed up on the beaches round Dunedin. The hydrocaulus does not attain a height of more than $\frac{3}{4}$ in., and only two of all the specimens collected showed branching. A good deal of variation is observable in all points of the structure. The teeth of the thecostome may be acute or obtuse, or even almost absent, leaving only a sinuous margin to the orifice. The character of the joint between the internodes varies in its obliqueness and distinctness. The swelling at the base of the hydrothecæ varies in size, and the distinctness of the wrinkles around the gonangium varies so as to make these either almost invisible or well-developed annulations.

Thuiaria subarticulata. Plate XX., figs. 6, 6*a*.

Thuiaria articulata, Hutton, 1872, Trans. N.Z. Inst., v., 258.

Thuiaria subarticulata: Coughtrey, 1874, *ib.*, vii., 287; 1875, *ib.*, viii., 301; 1876, Ann. Nat. Hist. (4), xvii., 30. Thompson, 1879, Ann. Nat. Hist. (5), iii., 110. Bale, 1888, Proc. Linn. Soc. N.S.W. (ser. 2), iii., 746.

Thuiaria bidens, Allman, 1876, Jnl. Linn. Soc. (Zool.), xii., 269.

Sertularia fertilis, Lendenfeld, 1884, Proc. Linn. Soc. N.S.W., ix., 406.

Trophosome: Hydrophyton erect. Hydrocaulus gives off alternate pinnæ at very short intervals; the more distant pinnæ are themselves branched. Hydrothecæ occur in pairs, subopposite, tubular, slightly sigmoid, and free for about one-third of their length. In all this like *Sertularia elongata*, but the absence of nodes on the hydrocaulus between every pair of hydrothecæ makes this distinctly a Thuiarian. The hydrothecæ have two small sharp teeth on the inner side of the thecostome, and two obscure blunt ones on the outer side.

Gonosome: Gonophore a short clear stalk surmounted by a barrel-shaped expansion, round which run six or eight ribs, exactly as in *S. johnstoni*, though here the ribs are much fewer in number.

Hab. Lyall Bay; Oamaru; Timaru; Taieri Beach.

SYNTHECIIDÆ.

Synthecium elegans. Plate XX., figs. 3, 3*a*.

Synthecium elegans: Allman, 1870, Gymno. Hyd., 229; 1876, Jnl. Linn. Soc. (Zool.), xii., 266. Coughtrey, 1874, Trans. N.Z. Inst., vii., 285.

Sertularia elegans, Coughtrey, 1875, *ib.*, viii., 301; 1876, Ann. Nat. Hist. (4), xvii., 29.

Trophosome: Hydrocaulus attains a height of about ½ in. or less, springing from a creeping filament, and very sparingly branched, or not branched at all. Internodes separated from each other by a deep constriction. Hydrothecæ borne along both the main stem and its branches, deep, tubular, cylindrical, perfectly even thecostome, adnate to the internode for about half their height, then becoming free and curving outwards.

Gonosome: Not present.

Hab. New Zealand (Allman); Stewart Island (Coughtrey). My own specimens came from Dunedin, Upper Harbour, on shells.

The gonosome of this species is so remarkable as to have necessitated the placing of the almost typical Sertularian into a distinct family. Although there were none present in my specimens, I shall here give Allman's description, from Jnl. Linn. Soc. (Zool.), xii., 266: "Gonangia large, elliptical, opening on the summit by a tubular orifice, strongly annulated,

with the annular ridges discontinuous where they meet in a mesual zig-zag line on the front and back of the gonangium. Peduncle of the gonangium entirely concealed within the hydrotheca, which encloses it." Allman's specimen, obtained from Mr. Busk's collection, had at least a dozen gonangia on it; but of all the specimens examined by Coughtrey only the lower three-quarters of one was found, and my specimens have none at all. The close approximation of the opposite hydrothecæ, which gave the genus its name, is, however, quite sufficient for purposes of identification. Allman's must have been a very favourable specimen, for he draws it at least 2 in. in height, while Coughtrey speaks of his numerous specimens as "pigmies in size," and mine never exceed a bare ½ in. The polyps themselves are very active, protrude a great distance from the hydrotheca, and actively wave their particularly long tentacles in search of prey.

CAMPANULARIDÆ.

* **Hypanthea asymmetrica,** nov. sp. Plate XX., figs. 4, 4*a*, 4*b*.

Trophosome: Hydrocaulus a creeping, branched, reticulated stolon, which gives off peduncles at intervals along its length. Peduncles ½ in. in height, having three or four very definite constrictions, between which the perisarc takes on a dice-box shape. Perisarc immensely thickened, and very asymmetrically in the hydrotheca. Zooid with a great lobe filling up part of the irregular cavity of the hydrotheca.

Gonosome: Not present.

Hab. Rock-pools at Kuri Beach; rather rare, creeping over seaweeds.

The one-sided thickening of the perisarc of the hydrotheca noticed in *H. aggregata* and *H. bilabiata* is here carried to an enormous degree. The cavity of the hydrotheca is hardly saucer-shaped, but almost quite flat. The canal through which the cœnosarc runs is not in the centre of the hydrotheca, but quite to one side, and the mouth and centre of the tentacular circuit are in the same straight line with this. Then, projecting from the side of the hydranth is an oval lobe, nearly as big as the zooid itself, and almost constricted off from it. In this is lodged a red pigment, sometimes dull, but sometimes bright-vermilion. I should have been tempted to call this the gonophore if it had not been so unique a thing among Calyptoblasts, although common among Gymnoblasts, and if I had not caught on one occasion, in conjunction with a specimen of this species, a broken part of what may have been a gonangium. I have given a sketch of the supposed shape of this gonangium. The excessive thickening of the perisarc observed in the hydrotheca is carried into the

peduncle, where the wall is at least one and a half times as thick as the cavity is wide, and into the hydrorhiza, where it is reticulated. The specific name is given because of the marked departure from the radial symmetry usually found in hydroids.

Hypanthea bilabiata. Plate XX., figs. 5, 5*a*.

Campanularia bilabiata, Coughtrey, 1874, Trans. N.Z. Inst., vii., 291; 1875, *ib.*, viii., 299; 1876, Ann. Nat. Hist. (4), xvii., 25.

Eucopella campanularia, Von Lendenfeld, 1883, Zeit. weiss. Zoo., 38, 497; 1884, Proc. Linn. Soc. N.S.W., ix., 608. Bale, 1888, Proc. Linn. Soc. N.S.W. (2), iii., 751; 1888, Cat. Aus. Hyd., 60.

Trophosome: "Hydrocaulus a creeping and reticulated stolon, from which are emitted scattered simple pedicels. The pedicels are about $\frac{1}{4}$ in. in height, and with a swollen summit, which, through the intervention of a single globular segment, supports the hydrotheca." The pedicel is smooth and cylindrical. Hydrothecæ bilaterally symmetrical, with an oblique bilabiate entire margin. The walls of the hydrothecæ, peduncles, and hydrorhiza are greatly thickened, the perisarc thinning away only where the peduncle springs from the hydrorhiza.

Gonosome: Gonangia more numerous than nutritive zooids, springing, like the peduncles of the hydrothecæ, from the creeping stolon. Two forms, one as long as the peduncle with its hydrotheca, and another barely half as long as this. Both are urceolate, raised on very short but definite pedicels, and have greatly thickened perisarc.

Hab. Australia; Timaru; Tomahawk (Dunedin): on seaweeds, in rock-pools.

This species combines some of the characters of both *H. hemispherica* and *H. aggregata*, as described by Allman in the "'Challenger' Reports." It agrees with *H. aggregata* in its size (about $\frac{1}{2}$ in.), in the conical shape of its hydrotheca, and the thinness of its perisarc (relative to that of *H. hemispherica*). It agrees with *H. hemispherica* in the shape of its large gonangia, in their size, and in their distribution, being not densely aggregated, but occurring about alternately with the hydrothecæ. The perisarc of the peduncle as it nears the point of junction with the hydrorhiza thins away till it is no thicker than that of an ordinary Campanularian. The compression of the hydrotheca causing a bilateral symmetry is very peculiar: it causes the perisarc to be thicker on one side than on the other, and an oblique orifice to the hydrotheca. The hydrotheca is set on the peduncle at an angle of about 45 degrees.

PLUMULARIIDÆ.

Plumularia setacea. Plate XXI., figs. 1, 1*a*, 1*b*, 1*c*, 1*d*.

Corallina setacea, Ellis, Corall., 38 (an. 1755).

Sertularia pinnata, Lin. Syst., 1312.

Sertularia setacea: Ellis and Soland., Zooph., 47. Lister, Phil. Trans., 1534, 371.

Aglaophenia setacea, Lamour., Cor. Flex., 272.

Plumularia setacea: Lam., Anim. s. Vert., ii., 129. Hassall, Ann. Nat. Hist., vii., 285. Couch, Zooph. Cornw., 16; Corn. Faun., iii., 33. Johnston, 1867, Brit. Zooph., 97. Hincks, 1868, Hist. Brit. Hyd., 296. Bale, 1888, Proc. Linn. Soc. N.S.W. (ser. 2), iii., 778.

Plumularia tripartita, v. Lendenfeld, 1884, Proc. Linn. Soc. N.S.W., ix., 477.

Trophosome: Hydrocaulus attaining a height of 4 in., sometimes branched, pinnæ alternate, situated one at the top of each of the long internodes. The pinnæ are divided into alternate long and short internodes, of which only the long ones bear hydrothecæ. Hydrothecæ small, adnate almost to the thecostome, so that the aperture has its plane almost at right angles to the axis of the pinna. The character of the nematophores places *P. setacea* in the section *Eleutheroplea*, for they are narrow at the base and movable. One springs from below each hydrotheca, and a pair just above it, one from each short internode of the pinna, and one from the base of each internode on the stem.

Gonosome: The character of the gonangia places *P. setacea* in the still further division of the Eleutheroplean Plumularians—the *Phyloctocarpa*. The gonathecæ spring upward from the axils of the pinnæ, and, each being longer than the interval between two pinnæ, are densely crowded. They are slender, fusiform, with a rather long tubular neck.

Hab. Europe; Australia; Timaru; Dunedin.

This is the only Plumularian I have found, but it is extremely abundant, and gives excellent opportunities for the study of the *Plumulariidæ* as a whole. The nematophores are abundant, and the thread cells of large size. In the theca of the nematophore there is an intrathecal ridge, by which the cavity of the cup is divided into proximal and distal parts: this ridge does not occur in the hydrothecæ. The body of the hydranth is divided by a constriction into two parts, in both of which the enteric cavity is of considerable size. The ectoderm is composed of small cells, but those of the endoderm are of great relative size, and have scattered through them granular gland cells. Great masses of pigment are lodged in both proximal and distal divisions of the enteric cavity; they

are of many colours, varying through yellow, brown, and green. From their constancy these seem to be lodged in the endoderm cells, and have nothing to do with the presence of food. A strong core of endoderm cells runs through the axis of each tentacle, the ectoderm of which is loaded with irregularly distributed nematocysts. The mouth is placed on a conical hypostome, and the mosaic arrangement of the ectoderm cells is very apparent on the expanded parts of the zooid. Two varieties of this species have come under my own notice. In one the hydrocaulus attains the height of 4 in. or even 5 in., the oldest parts having taken on a light-horn colour. The other variety seems never to attain a height of more than $\frac{3}{4}$ in. or $\frac{1}{2}$ in., has a milk-white appearance in the water, is really colourless, and occurs densely investing the seaweeds in rock-pools. The third variety is that described by von Lendenfeld under the name of *Plumularia tripartita*. This differs from *P. setacea* in the trilobation of the hydranth, and in a very different arrangement of the nematophores, the pairs of these structures occurring below instead of above the hydrothecæ. My variety, with its single constriction of the hydranth, is evidently intermediate between the European variety with no constriction and v. Lendenfeld's with two.

Sub-family STATOPLEA—AGLAOPHENIDÆ.

Section PHYLACTOCARPA.

Aglaophenia filicula. Plate XXI., figs. 2, 2*a*, 2*b*.

Aglaophenia filicula, 1873, Allman, Chall. Rep., part xx., p. 36.

Trophosome: Colony attaining a height of 3 in., rooted by a creeping tubular fibre. Hydrocladia about $\frac{1}{4}$ in., alternate. Hydrothecæ deep, thimble-shaped, serrated margin, with the median tooth larger than the lateral ones. Intrathecal ridge near the base of the hydrotheca, springing only from the inner side. Mesial nematophores adnate to walls of hydrothecæ for about three-fourths of their height, and then becoming free as a beak-like process which scarcely overtops the margin. Lateral nematophores tubular, overtopping the margin of the hydrothecæ.

Gonosome: Not present.

Hab. Taieri Beach and Martin's Bay, New Zealand; Azores.

The appearance of this hydroid is deceptively like that of *Sertularia elongata;* it is not very common, although not distinctly rare here. The only difference I have observed between my specimens and those described by Allman is that I have not found "an imperfect septum near the distal extremity

of the mesial nematophore." Allman found his specimen off the Azores in 2,700 ft. of water, while mine was cast up on a beach in New Zealand. The fact of it being found on this beach, however, says very little concerning its habitat, for the water off that part of the coast is very deep, very rapidly going to the 1,000-fathom line. Again, Antipatharians 5 ft. in height and 20 in. round the stem have been found on the same beach, so probably my specimen may be a deep-sea form, since Antipatharians of this size certainly are. Yet the fact that this species has been found only at the Azores and at New Zealand is interesting.

Since writing the above I have found a specimen at Taieri Beach, but there is not the slightest evidence as to whether it is a deep-sea form or not. This specimen differed in the following points from that found at Martin's Bay: (1) The colour is a light-horn, instead of a dark reddish-brown; (2) in the hydrocaulus two septa occur to one hydrotheca—one is just below the lateral nematotheca, the other just opposite the intrathecal ridge; (3) the intrathecal ridge is very distinct, and springs from all round the hydrotheca.

The following may be taken as a summary of the new facts set forth above:—

(1.) Three matters connected with geographical distribution: (*a.*) Concerning *Aglaophenia filicula*, which was hitherto found only in the Azores, I am inclined to think that this is a case of independent convergent modifications. Since we have so many nearly allied species of *Aglaophenia* here, it is not at all improbable that one should vary in the same way as those in the Azores. (*b.*) Concerning *Pedicellina gracilis*, this is distinctly a case for the distributionist; as also is (*c.*) *Tubiclava fruticosa*.

(2.) The discovery of a new genus so clearly intermediate between the two sub-orders of hydroids.

(3.) The discovery of the genus *Calycella* here; also another account of its reproduction, such accounts being rather scanty.

(4.) The ascertaining of the identity of Allman's genus *Hypanthea* with *Euplectella* and *Campanularia*.

(5.) A new species of *Obelia*, with a distinctively adaptive modification. The cuticular thickening is, I think, to be regarded as a protection against winter frosts.

(6.) A new species of *Hypanthea*.

EXPLANATION OF PLATES XVI.–XXI.

Plate XVI.

Fig. 1. *Tubiclava fruticosa.*
Fig. 1*a*. " (natural size).
Fig. 2. *Hemitheca intermedia.*
Fig. 2*a*. " (natural size).
Fig. 3. *Tubularia attennoides.*
Fig. 3*a*. " (natural size).
Fig. 3*b*. Tr. section of polyp.

Plate XVII.

Fig. 1. *Obelia nigrocaulus.*
Fig. 1*a*. " (natural size).
Fig. 2. *Obelia geniculata.*
Fig. 2*a*. " (natural size).
Fig. 3. *Calycella parkeri.*
Fig. 3*a*. Portion of tentacle, highly magnified.
Fig. 3*b*. Part of specimen (natural size).
Fig. 3*c*. Part of stem, highly magnified to show pigment in endoderm.
Fig. 3*d*. Variations of theca.

Plate XVIII.

Fig. 1. Four stages in the reproduction of *Calycella.*
Fig. 1*a*. A variety of gonosome.

Plate XIX.

Fig. 1. *Sertularia bispinosa.*
Fig. 1*a*. " (part), (natural size).
Fig. 2. *Sertularia johnstoni.*
Fig. 2*a*. " (natural size).
Fig. 3. *Sertularia elongata.*
Fig. 3*b*. " (showing gonangium).
Fig. 3*a*. Natural size of colony.

Plate XX.

Fig. 1. *Sertularia minima.*
Fig. 1*a*. Habitat of same (natural size).
Fig. 2. *Sertularia polyzonias.*
Fig. 2*a* " (natural size).
Fig. 3. *Synthecium elegans.*
Fig. 3*a*. " (natural size).
Fig. 4. *Hypanthea asymmetrica.*
Fig. 4*a*. " (natural size).
Fig. 4*b*. Supposed form of gonotheca.
Fig. 5. *Hypanthea bilabiata.*
Fig. 5*a*. Gonosome.
Fig. 6. *Thuiaria subarticulata.*
Fig. 6*a*. Gonophore.
Fig. 7. *Sertularia trispinosa.*
Fig. 7*a*., 7*b*. Two varieties of gonangium.

Plate XXI.

Fig. 1. *Plumularia setacea.*
Fig. 1*a*. " (natural size).
Fig. 1*b*. Variety showing constrictions in cœnosarc.
Fig. 1*c*. Gonangia.

PLATE XXI.—*continued.*

Fig. 1*d*. A gonangium with blastostyle and medusa buds.
Fig. 2. *Aglaophenia filicula*, from the side.
Fig. 2*a*. „ from in front.
Fig. 2*b*. „ (natural size).

ART. XXV. — *On the Occurrence of* Pedicellina *in New Zealand.*

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[*Read before the Otago Institute, 13th July, 1897.*]

Plate XXII.

AMONG hydroids I found, growing on the stems of *Obelia nigrocaulus*, the only representative of the *Polyzoa endoprocta* yet recorded from New Zealand. It is *Pedicellina gracilis*, Sars, Plate XXII., figs. 1, 1*a*, 1*b*; Johnstone, Brit. Zoo., 385; Goodsir, Ann. Nat. Hist., xv., 380; Hincks, Ann. Nat. Hist. (2), viii., 360, and Brit. Zooph., 570.

This Endoproctan is quite microscopic, and may be recognised by the enlarged base of the peduncle, in which the muscular power is placed, and to which the remarkably energetic movements of *Pedicellina gracilis* are due, the part above being a rigid rod supporting the almost globular body. The variety mentioned by Hincks with the muscular swelling elongated and divided into two or three parts was also present.

The finding of this specimen has extended the geographical distribution of the *Endoprocta* in a rather remarkable manner. Formerly members of this order had been found only in Norway, Spitzbergen, White Sea, and Roscoff. Now it is found in New Zealand, quite the antipodes of all the localities in which it was formerly found. The fact, too, of this being precisely the same species, and even presenting the two same varieties, is noteworthy.

EXPLANATION OF PLATE XXII.

1. *Pedicellina gracilis*, closed.
1*a*. „ with tentacles expanded.
1*b*. A variety of the same.